Clouds and the Earth's Radiant Energy System (CERES)

Data Management System

CERES Cloud Retrieval and Convolution Subsystems 4.1 through 4.4

Release 4 Test Plan Version 1

Primary Authors

Timothy D. Murray, Walter F. Miller, Ricky R. Brown, Sunny Sun-Mack

Science Applications International Corporation
One Enterprise Parkway, Suite 300
Hampton, VA 23666

NASA Langley Research Center
Radiation and Aerosols Branch
Atmospheric Sciences Competency
21 Langley Boulevard
Hampton, VA 23681-2199

SW Delivered to CM: June 2004
Document Date: June 2004

Document Revision Record

The Document Revision Record contains information pertaining to approved document changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover. The Head of the CERES Data Management Team approves or disapproves the requested changes based on recommendations of the Configuration Control Board.

Document Revision Record (1 of 2)

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
05/24/01	R3V4	262	• Added new subdirectory under the data Subdirectory chart in Appendix B. • Updated Table C.6-1. • Added instructions for copying the Instrument and MOA input files for the Cloud test cases to the instrument and sarb directories. • Updated the test summaries to accurately reflect run time for each test case. • For each test case, added reference to the text file which lists the expected output for each PGE. • Updated format to comply with standards.	Appendix B Appendix C All All All All
07/06/01	R3V5	273	• Added PGE CER4.1-4.1P2. • Updated format to comply with standards.	5.0 All
08/07/01	R3V6	284	• Added instructions for copying the Instrument and MOA input files to the instrument and sarb directories for PGE CER4.1-4.1P2. • Updated format to comply with standards.	5.0 All
10/02/01	R3V7	300	• Added an instruction for preparing VIRS files for processing. • Removed PGE CER4.1-4.4P1. • Updated format to comply with standards.	5.0 8.0 All
03/21/02	R3V8	318	• Changed test date for processing PGE CER4.1-4.1P2. • Updated Appendix B to include new directory for SSFA. • Updated file listings in Appendix C. • Updated format to comply with standards.	5.0 Appendix B Appendix C All

Document Revision Record (2 of 2)

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
06/03/02	R3V9	351	• Added PGE CER4.1-4.2P2. • Updated Appendix B to include new directory structure for PGE CER4.1-4.2P2 and for Snow-Ice Maps. • Updated Appendix C File Description. • Updated format to comply with standards.	7.0 Appendix B Appendix C All
01/29/03	R3V10	421	• Added PGE CER4.1-4.1P3. • Updated Appendix B to include new directory structure for PGE CER4.1-4.1P3. • Updated Appendix C File Description. • Updated format to comply with standards.	6.0 Appendix B Appendix C All
05/21/03	R3V11	439	• Updated compile sections to handle PGEs independently. • Changed test date for processing PGE CER4.1-4.1P2. • Updated format to comply with standards.	2.2 5.0 All
09/05/03	R3V12	467	• Updated Testing Date. • Updated format to comply with standards.	All All
12/22/03	R3V13	490	• Updated Testing Date. • Updated format to comply with standards.	6.0, 7.0, & 9.0 All
06/04/04	R4V1	536	• Update Testing Date. • Update Executable names for Aqua. • Updated format to comply with standards.	6.0, 7.0, & 9.0 Appendix C All

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 Introduction

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS). The CERES instrument provides radiometric measurements of the Earth's atmosphere from three broadband channels: a shortwave channel (0.3 - 5 μm), a total channel (0.3 - 200 μm), and an infrared window channel (8 - 12 μm). The CERES instruments are improved models of the Earth Radiation Budget Experiment (ERBE) scanner instruments, which operated from 1984 through 1990 on the National Aeronautics and Space Administration's (NASA) Earth Radiation Budget Satellite (ERBS) and on the National Oceanic and Atmospheric Administration's (NOAA) operational weather satellites NOAA-9 and NOAA-10. The strategy of flying instruments on Sun-synchronous, polar orbiting satellites, such as NOAA-9 and NOAA-10, simultaneously with instruments on satellites that have precessing orbits in lower inclinations, such as ERBS, was successfully developed in ERBE to reduce time sampling errors. CERES continues that strategy by flying instruments on the polar orbiting EOS platforms simultaneously with an instrument on the Tropical Rainfall Measuring Mission (TRMM) spacecraft, which has an orbital inclination of 35 degrees. In addition, to reduce the uncertainty in data interpretation and to improve the consistency between the cloud parameters and the radiation fields, CERES includes cloud imager data and other atmospheric parameters. The TRMM satellite carries one CERES instrument while the EOS satellites carry two CERES instruments, one operating in a fixed azimuth scanning mode and the other operating in a rotating azimuth scanning mode.

1.1 Document Overview

This document, CERES Cloud Retrieval and Convolution Subsystems 4.1 through 4.4 Release 4 Test Plan, is part of the CERES Subsystems 4.1 through 4.4 Release 4 delivery package provided to the Atmospheric Sciences Data Center (ASDC). It provides a description of the CERES Cloud Retrieval (4.1-4.3) and Convolution of Imager Cloud Properties with CERES Footprint Point Spread Function Subsystem (4.4) Release 4 software; supporting data files; and explains the procedures for installing, executing, and testing the software. A section is also included on validating the software results. A description of acronyms and abbreviations is provided in Appendix A, a directory structure diagram is contained in Appendix B, a description of the software and data files is contained in Appendix C, and an evaluation of the comparison software output is contained in Appendix D.

This document is organized as follows:

1.2 Subsystem Overview

1.2.1 CER4.1-4.0P1 - Snow and Ice Processor

The Snow and Ice Preprocessor reads available NSIDC and NESDIS Snow and Ice data sets for a given day and reprojects the data onto a 10-minute grid for use in Clouds Processing.

The primary input data set for the Snow and Ice Processor is the National Snow and Ice Data Center's Snow and Ice Map and National Environmental Satellite, Data & Information Services' Snow and Ice Maps. The primary output consists of individual 10-minute snow and ice maps.

1.2.2 CER4.1-4.1P1 - TRMM Main Processor

CER4.1-4.1P1 consists of two executables. The initial one is Cloud Retrieval Subsystem that produces a set of imager pixel clouds properties. It is followed by Convolution Subsystem that averages cloud microphysical and optical properties from imager pixels that are within the field of view of the CERES footprints.

The objective of the Cloud Retrieval Subsystem is to use high spectral and spatial resolution cloud imager data to determine cloud microphysical and optical properties. The major Cloud Retrieval science requirements include:

1. Prepare a "chunk" of pixels (multiple scan lines of imager data): Attach the imager radiometric data and various ancillary data to each imager pixel within the chunk. Classify each pixel as clear, cloudy, or uncertain. The pixel classification process uses various tests on the imager radiometric data and ancillary data to determine a cloud mask.
2. Determine cloud macrophysical properties (cloud layer and cloud top pressure) for cloudy pixels.
3. Determine cloud microphysical and optical properties (cloud base, effective radiating center, temperature, pressure, particle phase, particle size, optical depth at 0.65 micron, water/ice path, emittance at 10.8 micron, etc.) for cloudy pixels.

The primary input data sets for the Release 3 Cloud Retrieval Subsystem are:

1. Cloud Imager Data (CID): The CID product contains time code, pixel location, viewing geometry, and radiance data. The Release 3 test data are Visible Infrared Scanner, VIRS, and Moderate Resolution Imager Spectroradiometer, MODIS, imager data from the TRMM and Terra spacecraft, respectively.

2. SURFace MAP (SURFMAP): The SURFMAP data product is a set of maps for elevation, water content, scene ID, ecosystem, snow depth, ice coverage, and a terrain map on a 10-minute equal-angle grid.
3. Meteorological, Ozone, and Aerosol (MOA): The MOA data product contains meteorological data on the 1.0 x 1.0-degree European Center for Medium-range Weather Prediction (primary) or the 2.0 x 2.5-degree Data Assimilation Office (DAO) grid. (Surface temperature, surface pressure, atmospheric temperature, humidity, ozone and wind velocity profiles, precipitable water, column ozone and aerosols.)
4. Clear Radiance History (CRH): The Release 3 CRH data product contains albedo, brightness temperature, and the cosine of the solar zenith angle on a 10-minute equal-angle grid.

The primary output products of the Cloud Retrieval Subsystem are:

1. Cookiedough: The pixel-based cloud properties, input to Subsystem 4.4
2. CloudVis and Subset CloudVis: Visualization products
3. A binary Quality Control (QC) report
4. CRH_Update: Contains CRH values for all clear pixels in the hour

The objective of the Convolution Subsystem is to average the higher spectral and spatial resolution cloud imager data derived cloud microphysical and optical properties within the larger CERES footprint weighted by the CERES instruments point spread function. This provides a set of cloud properties optimally designed for studies of the role of clouds in the Earth's radiation budget, and enables the cloud physical properties to be tied to the cloud broadband radiative properties in a consistent manner. This initial estimate of cloud properties is modified in Subsystem 5 to obtain consistency in cloud properties and Top-of-the-Atmosphere (TOA) broadband radiative fluxes.

The major objectives of this Subsystem include:

1. Locate imager pixels within a CERES footprint by calculating the value of the Point Spread Function (PSF) for each pixel with respect to the centroid of the CERES field of view (FOV). If the PSF value exceeds a specified threshold value, the pixel is included in the footprint.
2. Accumulate statistics of cloud properties for all imager pixels within the CERES footprint and write the footprint records to the intermediate Single Scanner Footprint TOA and Surface Fluxes Clouds (SSF) output file.
3. Write diagnostic and statistical information from each run to the Quality Control (QC) report files.

The primary input data sets for the Convolution Subsystem are:

1. The CERES Instrument Earth Scans (IES) data product contains time of observation, geolocation data, and filtered radiances for each footprint in spatial order. The CERES footprint effective diameter is 10 km for Tropical Rainfall Measuring Mission (TRMM)

spacecraft and 20 km for EOS AM and PM spacecraft. IES file from both TRMM and Terra are used as the test data sets for Release 3.

2. The cloud imager data from Advanced Very High Resolution Radiometer (AVHRR), Visible Infrared Scanner (VIRS), or Moderate-Resolution Imaging Spectroradiometer (MODIS) are processed by Subsystems 4.1 - 4.3 and passed to convolution via the Imager Pixel Data file, commonly designated "Cookiedough." This file represents a two-dimensional array (N scanlines by M pixels per scanline) with a data structure associated with each pixel containing pixel location, viewing geometry, observation time, multispectral radiance data, scene type, and cloud properties as determined in Subsystems 4.1 through 4.3.

The output science product is the intermediate SSF product (SSFI). The intermediate SSF is subsequently processed and completed by Subsystem 4.5-4.6, and the resulting final SSF is an hourly CERES archival product that contains footprint geometry, radiance information, and the statistics for full footprint, clear footprint, cloudy footprint and overlap footprint areas. The secondary output products are the quality control reports. The quality control reports contains processing information, informative messages, and statistics. In Release 3, Subsystem 4.4 creates both a formatted (ASCII) report file (FQC) and a binary report file (FQCI) which is intended to be postprocessed by one or more of a variety of flexible programs for browsing, display, or data extraction.

1.2.3 CER4.1-4.1P2 - Terra Main Processor

CER4.1-4.1P2 consists of two executables. The initial one is Cloud Retrieval Subsystem that produces a set of imager pixel clouds properties. It is followed by Convolution Subsystem that averages cloud microphysical and optical properties from imager pixels that are within the field of view of the CERES footprints.

The objective of the Cloud Retrieval Subsystem is to use high spectral and spatial resolution cloud imager data to determine cloud microphysical and optical properties. The major Cloud Retrieval science requirements include:

1. Prepare a "chunk" of pixels (multiple scan lines of imager data): Attach the imager radiometric data and various ancillary data to each imager pixel within the chunk. Classify each pixel as clear, cloudy, or uncertain. The pixel classification process uses various tests on the imager radiometric data and ancillary data to determine a cloud mask.
2. Determine cloud macrophysical properties (cloud layer and cloud top pressure) for cloudy pixels.
3. Determine cloud microphysical and optical properties (cloud base, effective radiating center, temperature, pressure, particle phase, particle size, optical depth at 0.65 micron, water/ice path, emittance at 10.8 micron, etc.) for cloudy pixels.

The primary input data sets for the Release 3 Cloud Retrieval Subsystem are:

1. Cloud Imager Data (CID): The CID product contains time code, pixel location, viewing geometry, and radiance data. The Release 3 test data are Visible Infrared Scanner, VIRS,

and Moderate Resolution Imager Spectroradiometer, MODIS, imager data from the TRMM and Terra spacecraft, respectively.

2. SURFace MAP (SURFMAP): The SURFMAP data product is a set of maps for elevation, water content, scene ID, ecosystem, snow depth, ice coverage, and a terrain map on a 10-minute equal-angle grid.
3. Meteorological, Ozone, and Aerosol (MOA): The MOA data product contains meteorological data on the 1.0 x 1.0-degree European Center for Medium-range Weather Prediction (primary) or the 2.0 x 2.5-degree Data Assimilation Office (DAO) grid. (Surface temperature, surface pressure, atmospheric temperature, humidity, ozone and wind velocity profiles, precipitable water, column ozone and aerosols.)
4. Clear Radiance History (CRH): The Release 3 CRH data product contains albedo, brightness temperature, and the cosine of the solar zenith angle on a 10-minute equal-angle grid.
5. MODIS Aerosol Properties (MOD04): The MOD04 data product contains aerosol properties over both land and ocean determined from MODIS specific algorithms.

The primary output products of the Cloud Retrieval Subsystem are:

1. Cookiedough: The pixel-based cloud properties, input to Subsystem 4.4
2. CloudVis and Subset CloudVis: Visualization products
3. A binary Quality Control (QC) report
4. CRH_Update: Contains CRH values for all clear pixels in the hour

The objective of the Convolution Subsystem is to average the higher spectral and spatial resolution cloud imager data derived cloud microphysical and optical properties within the larger CERES footprint weighted by the CERES instruments point spread function. This provides a set of cloud properties optimally designed for studies of the role of clouds in the Earth's radiation budget, and enables the cloud physical properties to be tied to the cloud broadband radiative properties in a consistent manner. This initial estimate of cloud properties is modified in Subsystem 5 to obtain consistency in cloud properties and Top-of-the-Atmosphere (TOA) broadband radiative fluxes.

The major objectives of this Subsystem include:

1. Locate imager pixels within a CERES footprint by calculating the value of the Point Spread Function (PSF) for each pixel with respect to the centroid of the CERES field of view (FOV). If the PSF value exceeds a specified threshold value, the pixel is included in the footprint.
2. Accumulate statistics of cloud properties for all imager pixels within the CERES footprint and write the footprint records to the intermediate Single Scanner Footprint TOA and Surface Fluxes Clouds (SSF) output file.
3. Write diagnostic and statistical information from each run to the Quality Control (QC) report files.

The primary input data sets for the Convolution Subsystem are:

1. The CERES Instrument Earth Scans (IES) data product contains time of observation, geolocation data, and filtered radiances for each footprint in spatial order. The CERES footprint effective diameter is 10 km for Tropical Rainfall Measuring Mission (TRMM) spacecraft and 20 km for EOS AM and PM spacecraft. IES file from both TRMM and Terra are used as the test data sets for Release 3.
2. The cloud imager data from Advanced Very High Resolution Radiometer (AVHRR), Visible Infrared Scanner (VIRS), or Moderate-Resolution Imaging Spectroradiometer (MODIS) are processed by Subsystems 4.1 - 4.3 and passed to convolution via the Imager Pixel Data file, commonly designated "Cookiedough." This file represents a two-dimensional array (N scanlines by M pixels per scanline) with a data structure associated with each pixel containing pixel location, viewing geometry, observation time, multispectral radiance data, scene type, and cloud properties as determined in Subsystems 4.1 through 4.3.

The output science product is the intermediate SSF product (SSFI). The intermediate SSF is subsequently processed and completed by Subsystem 4.5-4.6, and the resulting final SSF is an hourly CERES archival product that contains footprint geometry, radiance information, and the statistics for full footprint, clear footprint, cloudy footprint and overlap footprint areas. The secondary output products are the quality control reports. The quality control reports contains processing information, informative messages, and statistics. In Release 3, Subsystem 4.4 creates both a formatted (ASCII) report file (FQC) and a binary report file (FQCI) which is intended to be postprocessed by one or more of a variety of flexible programs for browsing, display, or data extraction.

1.2.4 CER4.1-4.1P3 - Aqua Main Processor

CER4.1-4.1P3 consists of two executables. The initial one is Cloud Retrieval Subsystem that produces a set of imager pixel clouds properties. It is followed by Convolution Subsystem that averages cloud microphysical and optical properties from imager pixels that are within the field of view of the CERES footprints.

The objective of the Cloud Retrieval Subsystem is to use high spectral and spatial resolution cloud imager data to determine cloud microphysical and optical properties. The major Cloud Retrieval science requirements include:

1. Prepare a "chunk" of pixels (multiple scan lines of imager data): Attach the imager radiometric data and various ancillary data to each imager pixel within the chunk. Classify each pixel as clear, cloudy, or uncertain. The pixel classification process uses various tests on the imager radiometric data and ancillary data to determine a cloud mask.
2. Determine cloud macrophysical properties (cloud layer and cloud top pressure) for cloudy pixels.

3. Determine cloud microphysical and optical properties (cloud base, effective radiating center, temperature, pressure, particle phase, particle size, optical depth at 0.65 micron, water/ice path, emittance at 10.8 micron, etc.) for cloudy pixels.

The primary input data sets for the Release 3 Cloud Retrieval Subsystem are:

1. Cloud Imager Data (CID): The CID product contains time code, pixel location, viewing geometry, and radiance data. The Release 3 test data are Visible Infrared Scanner, VIRS, and Moderate Resolution Imager Spectroradiometer, MODIS, imager data from the TRMM and Terra spacecraft, respectively.
2. SURFace MAP (SURFMAP): The SURFMAP data product is a set of maps for elevation, water content, scene ID, ecosystem, snow depth, ice coverage, and a terrain map on a 10-minute equal-angle grid.
3. Meteorological, Ozone, and Aerosol (MOA): The MOA data product contains meteorological data on the 1.0 x 1.0-degree European Center for Medium-range Weather Prediction (primary) or the 2.0 x 2.5-degree Data Assimilation Office (DAO) grid. (Surface temperature, surface pressure, atmospheric temperature, humidity, ozone and wind velocity profiles, precipitable water, column ozone and aerosols.)
4. Clear Radiance History (CRH): The Release 3 CRH data product contains albedo, brightness temperature, and the cosine of the solar zenith angle on a 10-minute equal-angle grid.

The primary output products of the Cloud Retrieval Subsystem are:

1. Cookiedough: The pixel-based cloud properties, input to Subsystem 4.4
2. CloudVis and Subset CloudVis: Visualization products
3. A binary Quality Control (QC) report
4. CRH_Update: Contains CRH values for all clear pixels in the hour

The objective of the Convolution Subsystem is to average the higher spectral and spatial resolution cloud imager data derived cloud microphysical and optical properties within the larger CERES footprint weighted by the CERES instruments point spread function. This provides a set of cloud properties optimally designed for studies of the role of clouds in the Earth's radiation budget, and enables the cloud physical properties to be tied to the cloud broadband radiative properties in a consistent manner. This initial estimate of cloud properties is modified in Subsystem 5 to obtain consistency in cloud properties and Top-of-the-Atmosphere (TOA) broadband radiative fluxes.

The major objectives of this Subsystem include:

1. Locate imager pixels within a CERES footprint by calculating the value of the Point Spread Function (PSF) for each pixel with respect to the centroid of the CERES field of view (FOV). If the PSF value exceeds a specified threshold value, the pixel is included in the footprint.

2. Accumulate statistics of cloud properties for all imager pixels within the CERES footprint and write the footprint records to the intermediate Single Scanner Footprint TOA and Surface Fluxes Clouds (SSF) output file.
3. Write diagnostic and statistical information from each run to the Quality Control (QC) report files.

The primary input data sets for the Convolution Subsystem are:

1. The CERES Instrument Earth Scans (IES) data product contains time of observation, geolocation data, and filtered radiances for each footprint in spatial order. The CERES footprint effective diameter is 10 km for Tropical Rainfall Measuring Mission (TRMM) spacecraft and 20 km for EOS AM and PM spacecraft. IES file from both TRMM and Terra are used as the test data sets for Release 3.
2. The cloud imager data from Advanced Very High Resolution Radiometer (AVHRR), Visible Infrared Scanner (VIRS), or Moderate-Resolution Imaging Spectroradiometer (MODIS) are processed by Subsystems 4.1 - 4.3 and passed to convolution via the Imager Pixel Data file, commonly designated "Cookiedough." This file represents a two-dimensional array (N scanlines by M pixels per scanline) with a data structure associated with each pixel containing pixel location, viewing geometry, observation time, multispectral radiance data, scene type, and cloud properties as determined in Subsystems 4.1 through 4.3.

The output science product is the intermediate SSF product (SSFI). The intermediate SSF is subsequently processed and completed by Subsystem 4.5-4.6, and the resulting final SSF is an hourly CERES archival product that contains footprint geometry, radiance information, and the statistics for full footprint, clear footprint, cloudy footprint and overlap footprint areas. The secondary output products are the quality control reports. The quality control reports contains processing information, informative messages, and statistics. In Release 3, Subsystem 4.4 creates both a formatted (ASCII) report file (FQC) and a binary report file (FQCI) which is intended to be postprocessed by one or more of a variety of flexible programs for browsing, display, or data extraction.

1.2.5 CER4.1-4.2P1 - Daily QC Processor

The Daily QC processor reads all available gridded and binned QC files for a given day and generates the respective daily averaged QC files.

The primary input data sets for the PGE are:

EQCHG: Contains gridded quality control information in a binary format for an hour.
EQCHB: Contains binned quality control information in a binary format for an hour.

The output science products are a new clear-sky reflectance map for the next day, a daily gridded quality control report, and a daily binned quality control report.

1.2.6 CER4.1-4.2P2 - Daily CRH Processor

The Daily CRH processor reads all available CRH_Update files for a given day and generates an updated CRH file for the next days processing.

The primary input data sets for the PGE are:

ECRHU: Contains CRH values for all clear pixels in an hour.

The output science products are a new clear-sky reflectance map for the next day.

1.2.7 CER4.1-4.3P1 - Monthly QC Processor

The Monthly QC Processor reads all available binned and gridded QC for a given day and generates the respective monthly averaged QC files.

The primary input data sets for the Monthly QC Processor are:

EQCDG: The daily gridded QC file produced by CER4.1-4.2P1.
EQCDB: The daily binned QC file produced by CER4.1-4.2P1.
Note: A file listing of expected output for each PGE can be found in the following directory:

- $CERESHOME/clouds/data/out_comp/

2.0 Software and Data File Installation Procedures

This section describes how to install the Subsystems 4.1 through 4.4 Cloud Retrieval and Convolution software in preparation for making the necessary test runs at the Langley Atmospheric Sciences Data Center (ASDC). The installation procedures include instructions for uncompressing and untarring the delivered tar files, properly defining environmental variables, and compiling the Cloud Retrieval and Convolution programs.

2.1 Installation

Software/Data File Install Procedure:

1. All Software Installation and Test Procedures **must** be run from a t-shell (tcsh). Running otherwise could potentially produce bizarre results.
2. The scripts, makefiles, and Process Control Files in the Subsystems 4.1 through 4.4 delivery package expect the CERES environment variable, **$CERESENV**, to point to a file which sets the following environment variables:

PGSDIR	**- Directory for Toolkit libraries**
F90	**- Pointer to the SGI F90 64 bit compiler**
CERESHOME	**- Top Directory for CERES Software**
PGSMSG	**- Directory which contains Toolkit and CERES Status Message Files**
PGSLIB	**- Directory which contains SGI 64-bit Toolkit library file**
F90COMP	**- SGI F90 compiler options**
FCOMP	**- SGI F90 compiler options for f77**
CFLAGS	**- SGI C compiler options**
PGSINC	**- Pointer to the PGS include file directory**
HDFDIR	**- Pointer to the HDF home directory**
HDFINC	**- Pointer to the HDF include files**
HDFEOSDIR	**- Pointer to the HDFEOS Directory**
HDFEOSLIB	**- Pointer to the HDFEOS Library**

Failing definition of $CERESENV, subsystem analysts source /CERES/lib/sgi_lib/ceres-env.csh on thunder/lightning or /ENG/CERES/lib/ceres-env.csh on samantha in their login scripts.

3. Change directory to the directory where you plan to install the Cloud Retrieval and Convolution Subsystems. (The following instructions assume that the directory will be **$CERESHOME.**)

   cd $CERESHOME

4. Uncompress and untar all delivered tar files.

   The uncompressed files take up almost 4 Gbytes of disk space. Please allow for sufficient space to accommodate them. Certain input files are output from other Subsystems (SS1

and SS12). These include the IES, MOA, and attitude and ephemeris files. For convenience, these files were placed in the appropriate instrument and sarb directories and included in the tar files from those directories. You must have write permission to the instrument and sarb partitions when untarring the files.

2.2 Compilation

The instruction for compiling the snow and ice processor software for PGE CER4.1-4.0P1 are shown in Section 2.2.1, the instructions for compiling the clouds main processor software for PGE CER4.1-4.1Px are shown in Section 2.2.2, the instructions for compiling the daily QC processor software are shown in Section 2.2.3, the instructions for compiling the daily CRH processor software are shown in Section 2.2.4, and the instructions for compiling the monthly QC processor software are shown in Section 2.2.5. The compilation scripts will independently compile the PGE indicated as a calling parameter.

It will be necessary to execute the smfcompile utility on the files **CERES_25450.t, CERES_25460.t** and **FOOTPRINT_25500.t**:

```
cd $CERESHOME/clouds/smf
$CERESLIB/bin/smfcompile_all.csh
```

To create the required Product Generation System (PGS) include and message files for Subsystems 4.1 - 4.4.

2.2.1 Compiling PGE CER4.1-4.0P1

A single make script to compile all libraries and executables covered by this Test Plan is provided in the directory $CERESHOME/clouds/src. To run the make script, execute the following sequence of commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 2
$CERESHOME/clouds/src/makeall CER4.1-4.0P1
```

Execution of the make script is indicated by a scrolling list of those libraries and executables currently being compiled. Warning messages are allowed. Successful compilation is indicated by:

```
************************
* Compilation Successful *
************************
```

Anything else indicates failure.

2.2.2 Compiling PGE CER4.1-4.1P1, CER4.1-4.1P2, CER4.1-4.1P3

A single make script to compile all libraries and executables covered by this Test Plan is provided in the directory $CERESHOME/clouds/src. To run the make script, execute the following sequence of commands for the appropriate PGE:

For TRMM processing, CER4.1-4.1P1, execute the following commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 2
$CERESHOME/clouds/src/makeall libraries
$CERESHOME/clouds/src/makeall CER4.1-4.1P1
```

For Terra processing, CER4.1-4.1P2, execute the following commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/src/makeall libraries
$CERESHOME/clouds/src/makeall CER4.1-4.1P2
```

For Aqua processing, CER4.1-4.1P3, execute the following commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/src/makeall libraries
$CERESHOME/clouds/src/makeall CER4.1-4.1P3
```

Execution of the make script is indicated by a scrolling list of those libraries and executables currently being compiled. Warning messages are allowed. Successful compilation is indicated by:

```
************************
* Compilation Successful *
************************
```

Anything else indicates failure.

2.2.3 Compiling PGE CER4.1-4.2P1

A single make script to compile all libraries and executables covered by this Test Plan is provided in the directory $CERESHOME/clouds/src. To run the make script, execute the following sequence of commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/src/makeall CER4.1-4.2P1
```

Execution of the make script is indicated by a scrolling list of those libraries and executables currently being compiled. Warning messages are allowed. Successful compilation is indicated by:

```
************************
* Compilation Successful *
************************
```

Anything else indicates failure.

2.2.4 Compiling PGE CER4.1-4.2P2

A single make script to compile all libraries and executables covered by this Test Plan is provided in the directory $CERESHOME/clouds/src. To run the make script, execute the following sequence of commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/src/makeall CER4.1-4.2P2
```

Execution of the make script is indicated by a scrolling list of those libraries and executables currently being compiled. Warning messages are allowed. Successful compilation is indicated by:

```
************************
* Compilation Successful *
************************
```

Anything else indicates failure.

2.2.5 Compiling PGE CER4.1-4.3P1

A single make script to compile all libraries and executables covered by this Test Plan is provided in the directory $CERESHOME/clouds/src. To run the make script, execute the following sequence of commands:

```
cd $CERESHOME/clouds/src
source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/src/makeall CER4.1-4.3P1
```

Execution of the make script is indicated by a scrolling list of those libraries and executables currently being compiled. Warning messages are allowed. Successful compilation is indicated by:

```
************************
* Compilation Successful *
************************
```

Anything else indicates failure.

3.0 Test and Evaluation Procedures - CER4.1-4.0P1 Snow and Ice Processor

This section provides information on how to execute PGE CER4.1-4.0P1. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

3.1 Stand Alone Test Procedures

3.1.1 Execution

3.1.1.1 NSIDC Snow and Ice Data

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/bin/CER4.1-4.0P1.PCFGen 2001 06 14
$CERESHOME/clouds/bin/Run.CER4.1-4.0P1 $CERESHOME/clouds/rcf/CER4.1-4.0P1_PCF_CERES_NSIDCNESDIS_000000.20010614

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

3.1.2 Exit Codes

All CER4.1-4.0P1 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

3.1.3 Snow and Ice Processor Test Summary

PGE Number	PGE Name	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.0P1	Snow and Ice Processor	00:03	05	65

3.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

3.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 3.2.3.

3.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 3.2.3.

3.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. To run the comparison software, execute the following command:

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.0P1

3.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

3.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test case must be re-run, you must first cleanup the PCF file generated from a previous run as shown below.

   $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/ CER4.1-4.0P1_PCF_CERES_NSIDCNESDIS_000000.20010614

   Please contact Subsystem Lead for assistance if the cleanup and test case re-run are unsuccessful.

2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.

4.0 Test and Evaluation Procedures - CER4.1-4.1P1 TRMM Main Processor

This section provides information on how to execute PGE CER4.1-4.1P1. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

4.1 Stand Alone Test Procedures

4.1.0 VIRS Imager File Preparation (for Section 4.1.1.1)

The VIRS files, as received from TSDIS, are inappropriately named. Subsystems 4.1-4.3 need the VIRS files to be named according the following convention: CER_ECID_TRMM-VIRS.YYYYMMDD_HH.XX where YYYY is a four digit year, MM is the two digit month, DD is the two digit day, HH is the two digit hour, XX is a two digit sequence. All values correspond to the time of the hour being processed. Included in this delivery are code and scripts to accomplish the renaming needed. During the Execution phase of the Test Plan, appropriate instructions will be provided to correctly rename the correct VIRS files for that particular test case.

4.1.1 Execution

4.1.1.1 TRMM-VIRS Processing

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

Rename the full version of the VIRS file with the following commands:

source $CERESHOME/clouds/bin/CER4.1-4.env 2
$CERESHOME/clouds/bin/Run.CER4.1-4.0P1.RenameVIRS $CERESHOME/clouds/data/input/VIRS/1B01.980105.612.5.HDF

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

source $CERESHOME/clouds/bin/CER4.1-4.env
$CERESHOME/clouds/bin/CER4.1-4.1P1.PCFGen 1998 01 05 16
$CERESHOME/clouds/bin/Run.CER4.1-4.1P1 $CERESHOME/clouds/rcf/CER4.1-4.1P1_PCF_TRMM-PFM-VIRS_SSIT_000000.1998010516

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

4.1.2 Exit Codes

All CER4.1-4.1P1 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

4.1.3 Main Processor Test Summary

PGE Number	PGE Name	Test Case	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.1P1	Cloud Property Retrieval and Convolution	TRMM	26:20	400	280

4.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

4.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 4.2.3.

4.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 4.2.3.

4.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. The software must be run for each of the four test cases. To run the comparison software, execute the following commands:

source $CERESHOME/clouds/bin/CER4.1-4.env 2
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.1P1

4.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

4.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test cases must be re-run, you must first cleanup the PCF files generated from previous runs as shown below.
   - For TRMM-VIRS:
     $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/CER4.1-4.1P1_PCF_TRMM-PFM-VIRS_SSIT_000000.1998010516
   - Please contact Subsystem Lead for assistance if the cleanup and test cases re-run are unsuccessful.
2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.
3. Most errors encountered during PCF generation will provide a diagnostic as to the problem. If problems persist, check for the presence of all the mandatory input files and stage if necessary or contact the analyst.

5.0 Test and Evaluation Procedures - CER4.1-4.1P2 Terra Main Processor

This section provides information on how to execute PGE CER4.1-4.1P2. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

5.1 Stand Alone Test Procedures

5.1.0 MODIS Imager File Preparation (for Section 5.1.1.1)

5.1.1 Execution

5.1.1.1 Terra-MODIS Processing

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/bin/CER4.1-4.1P2.PCFGen 2000 06 15 23
$CERESHOME/clouds/bin/Run.CER4.1-4.1P2 $CERESHOME/clouds/rcf/CER4.1-4.1P2_PCF_Terra-FM1+FM2-MODIS_SSIT_000000.2000061523

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

There are 16 possible granules for each of three different MODIS file types, radiance, geolocation, and aerosol. The file names includes the creation time which there is no way of knowing for every file. An ls is done in the PCFGen script using the portion of the name we know. When a file is not found, the operating system returns “ls:No match”. This is not necessarily an error if MODIS files are missing. Problems will be identified during execution if a matched MODIS data set is not available.

5.1.2 Exit Codes

All CER4.1-4.1P2 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

5.1.3 Main Processor Test Summary

PGE Number	PGE Name	Test Case	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.1P2	Cloud Property Retrieval and Convolution	Terra	17:27	100	454

5.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

5.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 5.2.3.

5.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 5.2.3.

5.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. The software must be run for each of the four test cases. To run the comparison software, execute the following commands:

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.1P2

5.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

5.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test cases must be re-run, you must first cleanup the PCF files generated from previous runs as shown below.
   - For Terra-MODIS:
     $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/CER4.1-4.1P2_PCF_Terra-FM1+FM2-MODIS_SSIT_000000.2000061523
   - Please contact Subsystem Lead for assistance if the cleanup and test cases re-run are unsuccessful.
2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.
3. Most errors encountered during PCF generation will provide a diagnostic as to the problem. If problems persist, check for the presence of all the mandatory input files and stage if necessary or contact the analyst.

6.0 Test and Evaluation Procedures - CER4.1-4.1P3 Aqua Main Processor

This section provides information on how to execute PGE CER4.1-4.1P3. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

6.1 Stand Alone Test Procedures

6.1.0 MODIS Imager File Preparation (for Section 6.1.1.1)

6.1.1 Execution

6.1.1.1 Aqua-MODIS Processing

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/bin/CER4.1-4.1P3.PCFGen 2003 07 01 17
$CERESHOME/clouds/bin/Run.CER4.1-4.1P3 $CERESHOME/clouds/rcf/CER4.1-4.1P3_PCF_Aqua-FM3+FM4-MODIS_SSIT_000000.2003070117

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

6.1.2 Exit Codes

All CER4.1-4.1P3 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

6.1.3 Main Processor Test Summary

PGE Number	PGE Name	Test Case	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.1P3	Cloud Property Retrieval and Convolution	Aqua	39:52	100	454

6.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

6.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 6.2.3.

6.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 6.2.3.

6.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. The software must be run for each of the four test cases. To run the comparison software, execute the following commands:

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.1P3

6.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

6.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test cases must be re-run, you must first cleanup the PCF files generated from previous runs as shown below.
   - For Aqua-MODIS:
     $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/CER4.1-4.1P3_PCF_Aqua-FM3+FM4-MODIS_SSIT_000000.2003070117
   - Please contact Subsystem Lead for assistance if the cleanup and test cases re-run are unsuccessful.
2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.
3. Most errors encountered during PCF generation will provide a diagnostic as to the problem. If problems persist, check for the presence of all the mandatory input files and stage if necessary or contact the analyst.

7.0 Test and Evaluation Procedures - CER4.1-4.2P1 Daily QC Processor

This section provides information on how to execute PGE CER4.1-4.2P1. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

7.1 Stand Alone Test Procedure

7.1.1 Execution

7.1.1.1 All Data Sources

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/bin/CER4.1-4.2P1.PCFGen 2003 07 01
$CERESHOME/clouds/bin/Run.CER4.1-4.2P1 $CERESHOME/clouds/rcf/CER4.1-4.2P1_PCF_Aqua-MODIS_SSIT_000000.20030701

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

There are 16 possible granules for each of three different MODIS file types, radiance, geolocation, and aerosol. The file names includes the creation time which there is no way of knowing for every file. An ls is done in the PCFGen script using the portion of the name we know. When a file is not found, the operating system returns “ls:No match”. This is not necessarily an error if MODIS files are missing. Problems will be identified during execution if a matched MODIS data set is not available.

7.1.2 Exit Codes

All CER4.1-4.2P1 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

7.1.3 Daily QC Processor Test Summary

PGE Number	PGE Name	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.2P1	Daily QC Processor	00:41	200	348

7.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

7.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 7.2.3.

7.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 7.2.3.

7.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. To run the comparison software, execute the following command:

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.2P1

7.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

7.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test case must be re-run, you must first cleanup the PCF file generated from a previous run as shown below.

   $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/ CER4.1-4.2P1_PCF_Aqua-MODIS_SSIT_000000.20030701

   Please contact Subsystem Lead for assistance if the cleanup and test case re-run are unsuccessful.

2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.

8.0 Test and Evaluation Procedures - CER4.1-4.2P2 Daily CRH Processor

This section provides information on how to execute PGE CER4.1-4.2P2. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

8.1 Stand Alone Test Procedure

8.1.1 Execution

8.1.1.1 All Data Sources

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/bin/CER4.1-4.2P2.PCFGen 2000 06 15
$CERESHOME/clouds/bin/Run.CER4.1-4.2P2 $CERESHOME/clouds/rcf/CER4.1-4.2P2_PCF_Terra-MODIS_SSIT_000000.20000615

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

8.1.2 Exit Codes

All CER4.1-4.2P2 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

8.1.3 Daily CRH Processor Test Summary

PGE Number	PGE Name	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.2P2	Daily CRH Processor	00:41	200	348

8.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

8.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 8.2.3.

8.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 8.2.3.

8.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. To run the comparison software, execute the following command:

source $CERESHOME/clouds/bin/CER4.1-4.env 3
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.2P2

8.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

8.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test case must be re-run, you must first cleanup the PCF file generated from a previous run as shown below.

   $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/ CER4.1-4.2P2_PCF_Terra-MODIS_SSIT_000000.20000615

   Please contact Subsystem Lead for assistance if the cleanup and test case re-run are unsuccessful.

2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.

9.0 Test and Evaluation Procedures - CER4.1-4.3P1 Monthly QC Processor

This section provides information on how to execute PGE CER4.1-4.3P1. It also provides an overview of the test and evaluation procedures. It includes a description of what is being tested and the order in which the tests should be performed.

9.1 Stand Alone Test Procedures

9.1.1 Execution

9.1.1.1 All Data Sources

The following command will copy the necessary input files for running this PGE. This command only needs to be executed if the input files have not been copied to the appropriate directories already. Copy the input files to appropriate locations using the following script:

$CERESHOME/clouds/test_suites/scripts/Copy_input.csh

The PGE can be executed with the following sequence of commands listed below. This sequence of commands covers PCF generation as well as execution of the PGE.

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/bin/CER4.1-4.3P1.PCFGen 2003 07
$CERESHOME/clouds/bin/Run.CER4.1-4.3P1 $CERESHOME/clouds/rcf/CER4.1-4.3P1_PCF_Aqua-MODIS_SSIT_000000.200307

Note: A file listing of expected output for each PGE can be found in the following file:

- $CERESHOME/clouds/data/out_exp/out_description.txt

9.1.2 Exit Codes

All CER4.1-4.3P1 software terminates using the CERES defined EXIT CODES for the Langley TRMM Information System (LaTIS). Successful completion is indicated by an exit code of 0.

9.1.3 Monthly QC Processor Test Summary

PGE Number	PGE Name	Run Time (mm:ss)	Disk Storage (MB)	Memory (MB)
CER4.1-4.3P1	Monthly QC Processor	00:02	350	348

9.2 Evaluation Procedures

The Test Evaluation procedures must be run on the same day that the Test is run. If unable to run the Evaluation procedures at that time, contact the analyst for a work around.

The following will remove the Instrument and MOA input data files that were used for testing. This step is done when all testing is complete. **If you are testing another PGE, then it is not necessary to do this step.**

$CERESHOME/clouds/test_suites/scripts/Remove_input.csh

9.2.1 Log and Status File Results

The Log and Status files are created by the Toolkit and are located in the directory $CERESHOME/clouds/data/runlogs after the PGE has been executed. The comparisons of the Log and status files with their expected outputs are handled in Section 9.2.3.

9.2.2 Metadata Evaluation

Metadata files for this PGE are created at runtime and are located with their corresponding output files. The comparisons of the metadata files with their expected results are handled in Section 9.2.3.

9.2.3 Execution of Comparison Software

The evaluation software for this Subsystem will compare the ASDC generated output with the expected output included with this delivery package. To run the comparison software, execute the following command:

source $CERESHOME/clouds/bin/CER4.1-4.env 6
$CERESHOME/clouds/test_suites/bin/CER4.1-4.Validate CER4.1-4.3P1

9.2.4 Evaluation of Comparison Software Output

See Appendix D for a description of the output from the Comparison Software.

9.3 Solutions to Possible Problems

1. Output files are opened with Status = NEW. If any of these files exist when the generating PGE is executed, the PGE will fail. These files must be removed before any attempt is made to re-run any of the PGEs after the initial run is made. The Toolkit Log files also need to be deleted before each run to be consistent with the expected output. The specific problems can generally be found in the LogReport and/or LogStatus files. NOTE: For testing purposes only, if the test case must be re-run, you must first cleanup the PCF file generated from a previous run as shown below.

   $CERESHOME/clouds/bin/Run.CER4.1-4.Cleanup $CERESHOME/clouds/rcf/ CER4.1-4.3P1_PCF_Aqua-MODIS_SSIT_000000.200307

   Please contact Subsystem Lead for assistance if the cleanup and test case re-run are unsuccessful.

2. Many problems encountered during compilation, linking, and execution are due to incorrect environment configuration. Generally, these problems make themselves readily apparent via compiler errors or termination of the program during the initialization stage during the first few seconds of execution.

Appendix A
Acronyms and Abbreviations

ASCII	American Standard Code Information Interchange
ASDC	Atmospheric Sciences Data Center
ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
CERES	Clouds and the Earth's Radiant Energy System
CERESlib	CERES library
CID	Cloud Imager Data
CRH	Clear Radiance History
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Office
EOS	Earth Observing System
EOS-AM	EOS Morning Crossing Mission
EOS-PM	EOS Afternoon Crossing Mission
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite
FOV	Field-of-View
F90	Fortran 90
IES	Instrument Earth Scans
ISCCP	International Satellite Land Surface Climatology Project
IVT	Instrument Validation Tape
LaTIS	Langley TRMM Information System
MCF	Metadata Control File
MOA	Meteorological, Ozone, and Aerosol
MODIS	Moderate-Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
PCF	Process Control File
PGE	Product Generation Executives
PGS	Product Generation System
PSF	Point Spread Function
QC	Quality Control
SCF	Science Computing Facility
SMF	Status Message File
SSF	Single Scanner Footprint TOA and Surface Fluxes, Clouds

SURFMAP	SURFace MAP
TOA	Top-of-the-atmosphere
TRMM	Tropical Rainfall Measuring Mission
VIRS	Visible and Infrared System

Appendix B
Directory Structure Diagram

Directory Structure for the Cloud Retrieval and Convolution Tar File

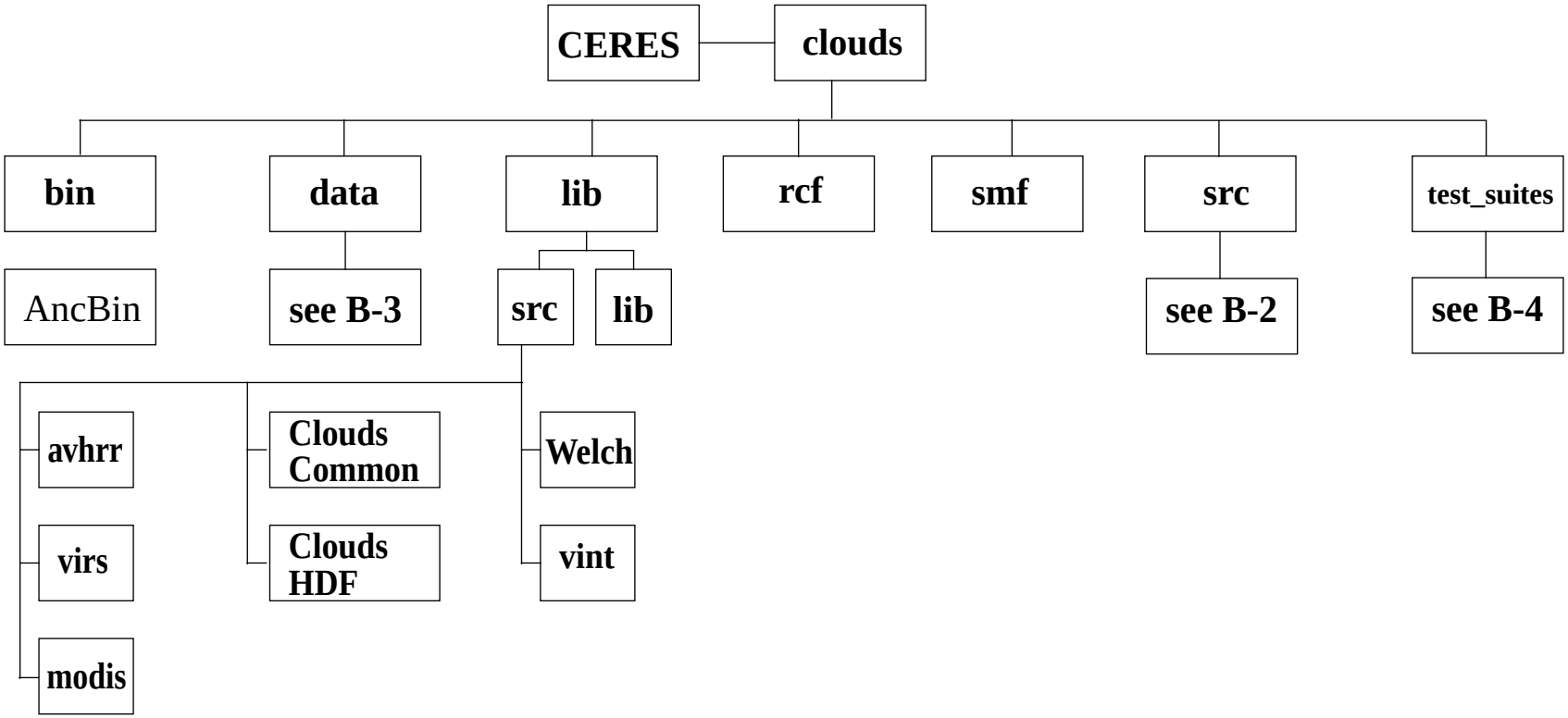

Figure B-1. Directory Structure for the Clouds Tar File (1 of 2)

Directory Structure for the Cloud Retrieval and Convolution Tar File

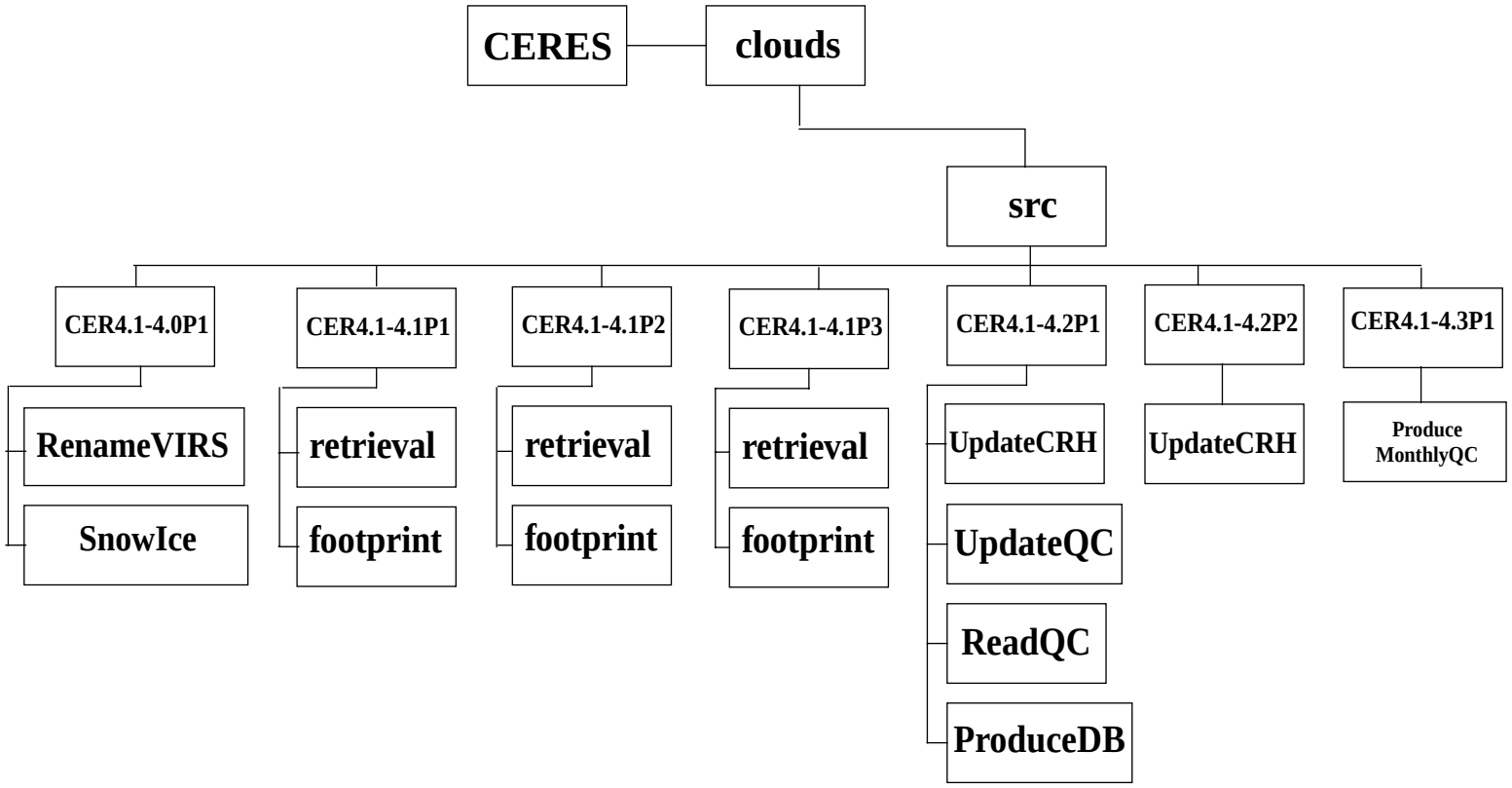

Figure B-1. Directory Structure for the Clouds Tar File (2 of 2)

Directory Structure for the data Subdirectory for the Clouds Tar File

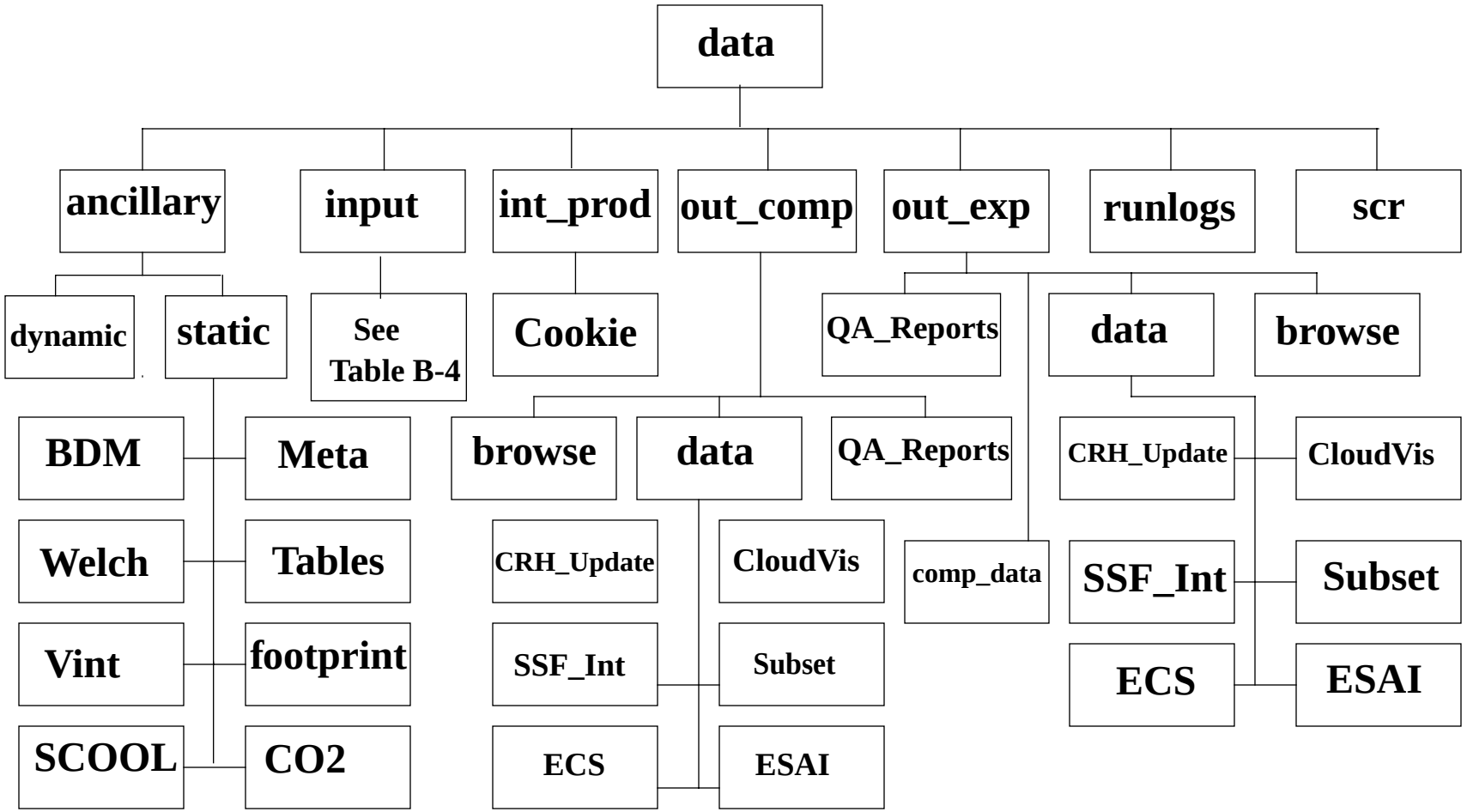

Figure B-2. Directory Structure for the Data Subdirectory of Clouds

Directory Structure for the test_suites Subdirectory for the Clouds Tar File

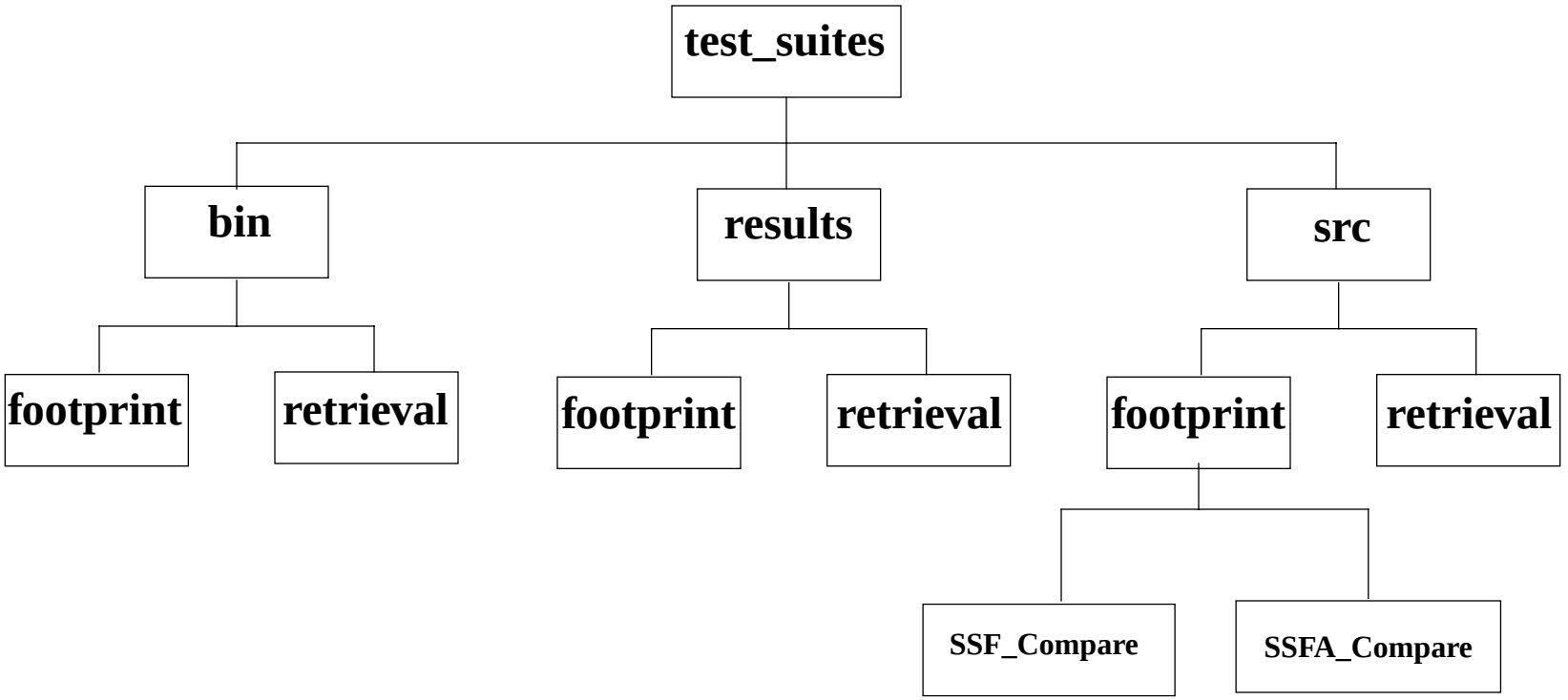

Figure B-3. Directory Structure for the test_suites Subdirectory for the Clouds Tar File

Directory Structure for the input Subdirectory for the Clouds Tar File

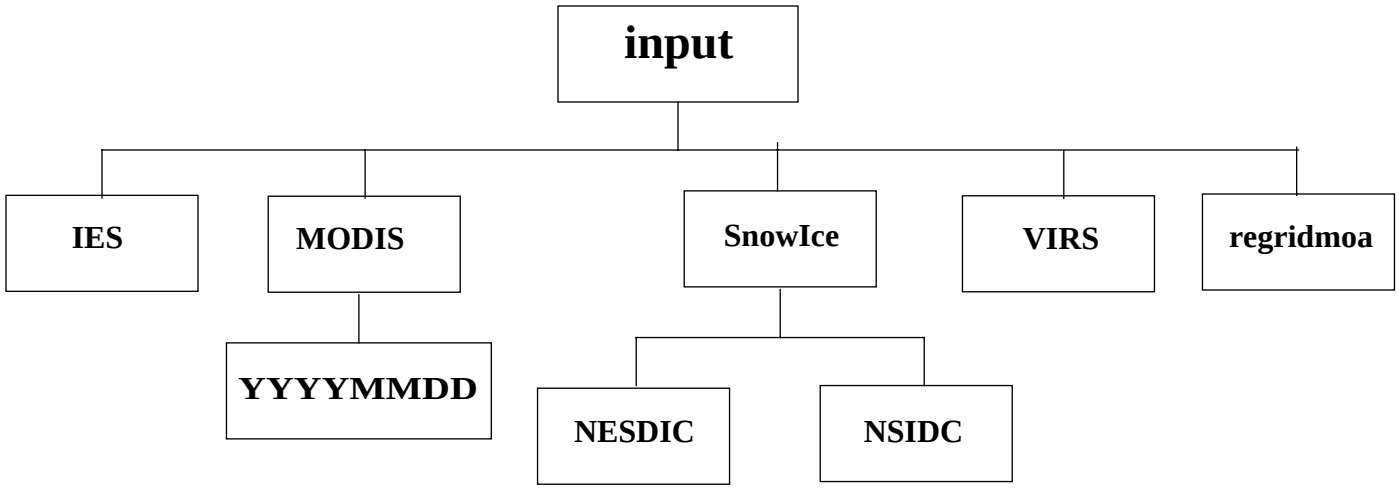

Figure B-4. Directory Structure for the input Subdirectory for the Clouds Tar File

Appendix C
File Description Tables

C.1 Production Scripts

Table C.1-1. Production Scripts (1 of 2)

File Name	Format	Description
CER4.1-4.PCFGen	ASCII	Generic C-Shell script for PCF generation
CER4.1-4.Tokens	ASCII	Generic C-Shell script for PCF generation
CER4.1-4.env	ASCII	Generic C-Shell script for PCF generation
Run.CER4.1-4.Cleanup	ASCII	Generic C-Shell cleanup script
Run.CER4.1-4.MailSummary	ASCII	Generic C-Shell mail script
CER4.1-4.0P1.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P1.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P2.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P3.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.2P1.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.3P1.PCFGen	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.0P1.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.1P1.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.1P2.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.1P3.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.2P1.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.2P2.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.3P1.PCFGen.IFile	ASCII	C-Shell script to generate the ASCII input file
CER4.1-4.0P1.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P1.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P2.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.1P3.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.2P1.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.2P2.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE
CER4.1-4.3P1.PCFGen.OFile	ASCII	C-Shell script to generate PCFile for PGE

Table C.1-1. Production Scripts (2 of 2)

File Name	Format	Description
Run.CER4.1-4.0P1	ASCII	C-Shell script to run PGE
Run.CER4.1-4.0P1.Rename-Month	ASCII	C-Shell script for running part of PGE CER4.1-4.0P1
Run.CER4.1-4.0P1.RenameVIRS	ASCII	C-Shell script for running part of PGE CER4.1-4.0P1
Run.CER4.1-4.0P1.SnowIce	ASCII	C-Shell script for running part of PGE CER4.1-4.0P1
Run.CER4.1-4.0P1.SubsetMonth	ASCII	C-Shell script for running part of PGE CER4.1-4.0P1
Run.CER4.1-4.1P1	ASCII	C-Shell script to run PGE
Run.CER4.1-4.1P1.retrieval	ASCII	C-Shell script for running part of PGE CER4.1-4.1P1
Run.CER4.1-4.1P1.footprint	ASCII	C-Shell script for running part of PGE CER4.1-4.1P1
Run.CER4.1-4.1P2	ASCII	C-Shell script to run PGE
Run.CER4.1-4.1P2.retrieval	ASCII	C-Shell script for running part of PGE CER4.1-4.1P2
Run.CER4.1-4.1P2.footprint	ASCII	C-Shell script for running part of PGE CER4.1-4.1P2
Run.CER4.1-4.1P3	ASCII	C-Shell script to run PGE
Run.CER4.1-4.1P3.retrieval	ASCII	C-Shell script for running part of PGE CER4.1-4.1P3
Run.CER4.1-4.1P3.footprint	ASCII	C-Shell script for running part of PGE CER4.1-4.1P3
Run.CER4.1-4.2P1	ASCII	C-Shell script to run PGE
Run.CER4.1-4.2P1.DailyBinned	ASCII	C-Shell script for running part of PGE CER4.1-4.2P1
Run.CER4.1-4.2P1.SCOOL	ASCII	C-Shell script for running part of PGE CER4.1-4.2P1
Run.CER4.1-4.2P1.UpdateCRH	ASCII	C-Shell script for running part of PGE CER4.1-4.2P1
Run.CER4.1-4.2P1.UpdateQC	ASCII	C-Shell script for running part of PGE CER4.1-4.2P1
Run.CER4.1-4.2P2	ASCII	C-Shell script to run PGE
Run.CER4.1-4.2P2.DailyBinned	ASCII	C-Shell script for running part of PGE CER4.1-4.2P2
Run.CER4.1-4.2P2.SCOOL	ASCII	C-Shell script for running part of PGE CER4.1-4.2P2
Run.CER4.1-4.2P2.UpdateCRH	ASCII	C-Shell script for running part of PGE CER4.1-4.2P2
Run.CER4.1-4.2P2.UpdateQC	ASCII	C-Shell script for running part of PGE CER4.1-4.2P2
Run.CER4.1-4.3P1	ASCII	C-Shell script to run PGE

C.2 Executables

Table C.2-1. Executables[1]

File Name	Format	Description
Exe.CER4.1-4.0P1.SnowIce	Binary	Snow and Ice Processor executable
Exe.CER4.1-4.0P1.RenameVIRS	Binary	Renaming VIRS file executable
Exe.CER4.1-4.1P1.retrieval	Binary	Cloud Retrieval executable
Exe.CER4.1-4.1P1.footprint	Binary	Convolution executable
Exe.CER4.1-4.1P2.retrieval	Binary	Cloud Retrieval executable
Exe.CER4.1-4.1P2.footprint	Binary	Convolution executable
Exe.CER4.1-4.1P3.retrieval	Binary	Cloud Retrieval executable
Exe.CER4.1-4.1P3.footprint	Binary	Convolution executable
Exe.CER4.1-4.2P1.DailyBinnedAqua	Binary	Daily Binned QC Report executable
Exe.CER4.1-4.2P1.ReadQCAqua	Binary	QC Read executable
Exe.CER4.1-4.2P1.UpdateCRH	Binary	Cloud Retrieval executable
Exe.CER4.1-4.2P1.UpdateQCAqua	Binary	Daily QC File Generator executable
Exe.CER4.1-4.2P2.DailyBinned	Binary	Daily Binned QC Report executable
Exe.CER4.1-4.2P2.ReadQC	Binary	QC Read executable
Exe.CER4.1-4.2P2.UpdateCRH	Binary	Cloud Retrieval executable
Exe.CER4.1-4.2P2.UpdateQC	Binary	Daily QC File Generator executable
Exe.CER4.1-4.3P1.ProduceMonthlyQ-CAqua	Binary	Monthly QC File Generator executable

1. These files will be generated on execution of Subsystem software and are not included in the tar file.

C.3 Status Message Files (SMF)

Table C.3-1. Status Message Files

File Name	Format	Description
CERES_25450	ASCII	Status Message File for Subsystem 4.1 - 4.3
CERES_25460	ASCII	Status Message File for Subsystem 4.1 - 4.3
FOOTPRINT_25500	ASCII	Status Message File for Subsystem 4.4

C.4 Processing Control Files (PCF) and Metadata Control Files (MCF)

The Process Control Files are not included in the Software Delivery Package. They will be created by the PCF generator scripts.

Table C.4-1. Metadata Control Files (1 of 2)

File Name	Format	Description
CECRHUAC.MCF	ODL	MCF for Update CRH files
CECRH_AC.MCF	ODL	MCF for CRH files
CECVS_AC.MCF	ODL	MCF For Subset CloudVis files
CECV__AC.MCF	ODL	MCF For CloudVis files
CEICE_AC.MCF	ODL	MCF For Ice Map
CEIPD_AC.MCF	ODL	MCF For Cookiedough files
CEQCB_AC.MCF	ODL	MCF for Cloud Retrieval Binary QC files
CEQCS_AC.MCF	ODL	MCF for Cloud Retrieval S'COOL files
CEQCDVAC.MCF	ODL	MCF for Cloud Retrieval Daily binned QC files
CEQCD_AC.MCF	ODL	MCF for Cloud Retrieval Daily QC files
CEQCMBAC.MCF	ODL	MCF for Cloud Retrieval Monthly binned QC files
CEQCMGAC.MCF	ODL	MCF for Cloud Retrieval Monthly gridded QC files
CEQCV_AC.MCF	ODL	MCF for Cloud Retrieval binned QC files
CESNOWAC.MCF	ODL	MCF For Snow Map
CFQCI_AB.MCF	ODL	MCF for Convolution ASCII QC Report
CFQC__AB.MCF	ODL	MCF for Convolution Binary QC Report
CFSSFIAB.MCF	ODL	MCF File for Intermediate SSF

Table C.4-1. Metadata Control Files (2 of 2)

File Name	Format	Description
CFSSFAAB.MCF	ODL	MCF for the Intermediate SSFA

Table C.4-2. Process Control Files[1] (1 of 2)

File Name	Format	Description
CER4.1-4.0P1_PCF_CERES_NSIDC_000000.19980105	ASCII	Process Control File template for Snow and Ice Processor
CER4.1-4.0P1_PCFin_CERES_NSIDC_000000.19980105	ASCII	ASCII file created by the ASCII file generator to be used by the Snow and Ice Processor's PCF generator
CER4.1-4.1P1_PCF_TRMM-PFM-VIRS_SSIT_000000.1998010516	ASCII	Process Control File template for Main Processor
CER4.1-4.1P1_PCFin_TRMM-PFM-VIRS_SSIT_000000.1998010516	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator
CER4.1-4.1P1_PCF_TRMM-PFM-VIRS_SubsetSSIT_000000.1998010516	ASCII	Process Control File template for Main Processor (Subset Mode)
CER4.1-4.1P1_PCFin_TRMM-PFM-VIRS_SubsetSSIT_000000.1998010516	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator (Subset Mode)
CER4.1-4.1P1_PCF_Terra-FM1+FM2_MODIS_SSIT_000000.2000062316	ASCII	Process Control File template for Main Processor
CER4.1-4.1P1_PCFin_Terra-FM1+FM2_MODIS_SSIT_000000.2000062316	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator
CER4.1-4.1P1_PCF_Terra-FM1+FM2_MODIS_SubsetSSIT_000000.2000062316	ASCII	Process Control File template for Main Processor
CER4.1-4.1P1_PCFin_Terra-FM1+FM2_MODIS_SubsetSSIT_000000.2000062316	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator
CER4.1-4.1P2_PCF_Terra-FM1+FM2_MODIS_SSIT_000000.2000062316	ASCII	Process Control File template for Main Processor

Table C.4-2. Process Control Files[1] (2 of 2)

File Name	Format	Description
CER4.1-4.1P2_PCFin_Terra-FM1+FM2_MODIS_SSIT_000000.2000062316	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator
CER4.1-4.1P3_PCF_Aqua-FM3+FM4_MODIS_SSIT_000000.2000062316	ASCII	Process Control File template for Main Processor
CER4.1-4.1P3_PCFin_Aqua-FM3+FM4_MODIS_SSIT_000000.2000062316	ASCII	ASCII file created by the ASCII file generator to be used by the Main Processor's PCF generator
CER4.1-4.2P1_PCF_TRMM-PFM-VIRS_SSIT_000000.19980105	ASCII	Process Control File template for Clear Sky Update Processor
CER4.1-4.2P1_PCFin_TRMM-PFM-VIRS_SSIT_000000.19980105	ASCII	ASCII file created by the ASCII file generator to be used by the Clear Sky Update Processor's PCF generator
CER4.1-4.2P2_PCF_TRMM-PFM-VIRS_SSIT_000000.19980105	ASCII	Process Control File template for Clear Sky Update Processor
CER4.1-4.2P2_PCFin_TRMM-PFM-VIRS_SSIT_000000.19980105	ASCII	ASCII file created by the ASCII file generator to be used by the Clear Sky Update Processor's PCF generator

1. These files will be generated on execution of Subsystem software and are not included in the tar file.

C.5 HDF Read Software

There is no HDF read software associated with the delivered PGEs.

C.6 Ancillary Input Data

Table C.6-1. Ancillary Input Data (1 of 5)

File Name	Format	Description
BDM/CER_EAI_BDM0063_015000.epoch	Binary	Bi-directional Model, 0.63
BDM/CER_EAI_BDM0160_015000.epoch	Binary	Bi-directional Model, 1.6
BDM/CER_EAI_DM0063_<SAT>-<IMAG>_015000.epoch	Binary	Directional Model, 0.63 micron

Table C.6-1. Ancillary Input Data (2 of 5)

File Name	Format	Description
BDM/ CER_EAI_DM0160_<SAT>-<IMAG>_015000.epoch	Binary	Directional Model, 1.6 micron
BDM/ CER_EAI_DM1663_<SAT>-<IMAG>_015000.epoch	Binary	Ratio Directional Model, 1.6/0.63
BDM/ CER_EAI_TOAREFALBSIMM0063_015000.epoch	Binary	Snow and Ice Reflectance Model for 0.6um summer
BDM/ CER_EAI_TOAREFALBSIMM0160S_015000.epoch	Binary	Snow and Ice Reflectance Model for 1.6um for summer
BDM/ CER_EAI_TOAREFALBSIMM0160W_015000.epoch	Binary	Snow and Ice Reflectance Model for 1.6um for winter
BDM/ CER_EAI_TOAREFALBSIMM0375S_015000.epoch	Binary	Snow and Ice Reflectance Model for 3.75um for summer
BDM/ CER_EAI_TOAREFALBSIMM0375W_015000.epoch	Binary	Snow and Ice Reflectance Model for 3.75um for winter
footprint/ CER_FPARAM_CERES_<CC>.epoch[1]	ASCII	Science inputs for footprint control
footprint/ CER_FPSF_<SAT><INST><IMAG>.<CC>.epoch[1]	ASCII	CERES point spread function for satellite/instrument/ and imager
footprint/ CER_FDBin_<SAT>-<INST>-<IMAG>_000000.epoch	ASCII	File listing footprints to print
footprint/ CER_FAOT063_CERES_<CC>.epoch[1]	Binary	Stowe third generation 0.63 Look-up Table
footprint/ CER_FAOT160_CERES_<CC>.epoch[1]	Binary	Stowe third generation 1.60 Look-up Table
Tables/CER_EICF_<SAT>-<IMAG>_014000.epoch	ASCII	Imager Coefficients
Tables/CER_EICF_<SAT>-<IMAG>_014000.epoch	ASCII	Calibration File
Tables/CER_EIEASE_CERES_00003.epoch	Binary	File for polar sterographic to cartesian coordinates
Tables/CER_EPARAM_<IMAG>.epoch	ASCII	Science inputs for retrieval control
Tables/CER_EPCParamMap_015000.epoch	ASCII	Logical IDs for PCF generation
Tables/CER_ESCF_Stowe-0063_015000.epoch	Binary	Stowe 0.63 LUT
Tables/CER_ESCF_Stowe-0160_015000.epoch	Binary	Stowe 1.6 LUT
Tables/CER_ESCF_CERESThres_015000.epoch	ASCII	CERES Cloud Mask Thresholds
Tables/CER_ESCF_ChiThrTable_015000.epoch	ASCII	CERES Chi Thresholds

Table C.6-1. Ancillary Input Data (3 of 5)

File Name	Format	Description
Tables/CER_ESCF_SubsetRegions_015000.epoch	ASCII	Subset CloudVis Regions
SCOOL/ CER_ESCF_SCOOLRegions_011000.YYYYMM[2]	ASCII	SCOOL Participant Locations for year YYYY and month MM
Vint/CER_EDM_<IMAG>.epoch	Binary	VINT Algorithm Input File
Vint/ERBEBDMreformatted.dat	ASCII	VINT Algorithm Input File
Vint/LNPWderiv.ch4.allvz.dy.dat	Binary	VINT Algorithm Input File
Vint/SkinTderiv.ch4.allvz.dy.dat	Binary	VINT Algorithm Input File
Vint/bdnnref.dat	Binary	VINT Algorithm Input File
Vint/channel2.coefs	Binary	VINT Algorithm Input File
Vint/channel3.coefs	Binary	VINT Algorithm Input File
Vint/channel4.coefs	Binary	VINT Algorithm Input File
Vint/channel5.coefs	Binary	VINT Algorithm Input File
Vint/dxalbmean.dat	ASCII	VINT Algorithm Input File
Vint/modelsnew.3.7.dat	Binary	VINT Algorithm Input File
Vint/modelsnew.dat	Binary	VINT Algorithm Input File
Vint/ratios1_6.dat	Binary	VINT Algorithm Input File
Vint/raybref.dat	Binary	VINT Algorithm Input File
Vint/table-invcld	ASCII	VINT Algorithm Input File
Vint/virs.corrk.coefs.1.interval	Binary	VINT Algorithm Input File
Vint/virs.corrk.coefs.5.intervals	ASCII	VINT Algorithm Input File
Vint/CER_ECOEFS_<IMAG>_CORRK.epoch	ASCII	VINT Algorithm Input File
Vint/all_dif_coefs	ASCII	VINT Algorithm Input File
Vint/CER_EMODEL_<IMAG>_0375.epoch	ASCII	VINT Algorithm Input File
Vint/nmodels.1.6.dat	ASCII	VINT Algorithm Input File
Vint/virsdir	ASCII	VINT Algorithm Input File
CO2/modisbnd.am1	Binary	CO2 Slicing Algorithm input file
CO2/modisdry.am1	Binary	CO2 Slicing Algorithm input file
CO2/modisozo.am1	Binary	CO2 Slicing Algorithm input file
CO2/modiswco.am1	Binary	CO2 Slicing Algorithm input file

Table C.6-1. Ancillary Input Data (4 of 5)

File Name	Format	Description
CO2/modiswtl.am1	Binary	CO2 Slicing Algorithm input file
CO2/modiswts.am1	Binary	CO2 Slicing Algorithm input file
CER_ECS/ CER_ECS-SOA0063m_<SAT>-<IMAG>_StartUp_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 0.63 mean
CER_ECS/ CER_ECS-SOA0063s_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 0.63 std
CER_ECS/ CER_ECS-SOA0160m_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 1.60 mean
CER_ECS/ CER_ECS-SOA0160s_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 1.60 std
CER_ECS/ CER_ECS-SOA1663m_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 1.6:0.63 ratio mean
CER_ECS/ CER_ECS-SOA1663s_015000.XXXXMM[3]	Binary	Start-up CRH map for Albedo 1.6:0.63 ratio Std
CER_ECS/ CER_ECS-SBT1080m_015000.XXXXMM[3]	Binary	Start-up CRH map for Brightness Temperature 10.8 mean
CER_ECS/ CER_ECS-SBT1080s_015000.XXXXMM[3]	Binary	Start-up CRH map for Brightness Temperature 10.8 std
CER_EDI/ CER_EDiCorrm_<MOA_SRC>_015000.XXXXMM[3]	Binary	Diurnal correction model for MOA product. Dependent on MOA source.
CER_EDI/ CER_EDiCorrs_<MOA_SRC>_015000.XXXXMM[3]	Binary	Diurnal correction model for MOA product. Dependent on MOA source.
CER_EANC/CER_EH2O_CERES_00003.epoch	Binary	Percent Water Coverage
CER_EANC/CER_EIGBP_CERES_011000.epoch	Binary	IGPB Ecosystem Map
CER_EANC/CER_ELEV_CERES_00003.epoch	Binary	Surface Elevation Map
CER_EANC/CER_ETERR_CERES_00003.epoch	Binary	Terrain Characteristic Map
CER_EANC/CER_EMOAF_CERES_011000.epoch	Binary	MOA Water Flag
CER_EANC/CER_EMOAS_CERES_000004.epoch	Binary	MOA Scene Type
CER_EANC/ CER_EMOAW_<MOA_SRC>_015000.epoch	Binary	MOA Water Percentage
CER_FANC/CER_FREFL_CERES_000005.epoch	ASCII	Reflect Algorithm Input File

Table C.6-1. Ancillary Input Data (5 of 5)

File Name	Format	Description
CER_EANC/ CER_WELCHMASK_<IMAG>_015000.epoch	Binary	Welch Algorithm Input File
CER_EANC/CER_WELCHTERR_015000.epoch	Binary	Welch Algorithm Input File
CER_EANC/ CER_WELCHMASK_Old19Chan_MODIS_015000. epoch	Binary	Welch Algorithm Input File
CER_EM/CER_EM0375_CERES_010000.XXXXMM[3]	Binary	Emissivity Map Channel 3.75
CER_EM/CER_EM1080_CERES_010000.XXXXMM[3]	Binary	Emissivity Map Channel 10.80
CER_EM/CER_EM1190_CERES_010000.XXXXMM[3]	Binary	Emissivity Map Channel 11.90

1. CC represents Configuration Code.
2. YYYYMM represents a specific year and month combination between 199801 and 199906.
3. XXXXMM represents a specific month without dependency on the year.

C.7 Output Temporary Data Files (Production Results)

Table C.7-1. Output Temporary Data Files[1] (1 of 2)

File Name	Format	Description
CER_IPD_TRMM-VIRS_SSIT_000000.1998010516	Binary	Imager data file containing pixel-level cloud property data
CER_IPD_TRMM-VIRS_SSIT_000000.1998010516.met	ODL	Metadata load file for imager data file
CER4.1-4.1P1_MCFScr_TRMM-PFM-VIRS_SSIT_000000.1998010516	ASCII	Toolkit generated file used in reading metadata
CER_IPD_TRMM-VIRS_SubsetSSIT_000000.1998010516	Binary	Imager data file containing pixel-level cloud property data
CER_IPD_TRMM-VIRS_SubsetSSIT_000000.1998010516.met	ODL	Metadata load file for imager data file
CER4.1-4.1P1_MCFScr_TRMM-PFM-VIRS_SubsetSSIT_000000.1998010516	ASCII	Toolkit generated file used in reading metadata
CER_IPD_Terra-MODIS_SSIT_000000.2000062316	Binary	Imager data file containing pixel-level cloud property data
CER_IPD_Terra-MODIS_SSIT_000000.2000062316.met	ODL	Metadata load file for imager data file
CER4.1-4.1P1_MCFScr_Terra-FM1+FM2-MODIS_SSIT_000000.2000062316	ASCII	Toolkit generated file used in reading metadata

Table C.7-1. Output Temporary Data Files[1] (2 of 2)

File Name	Format	Description
CER4.1-4.1P2_MCFScr_Terra-FM1+FM2-MODIS_SSIT_000000.2000062316	ASCII	Toolkit generated file used in reading metadata
CER4.1-4.1P3_MCFScr_Aqua-FM3+FM4-MODIS_SSIT_000000.2000062316	ASCII	Toolkit generated file used in reading metadata
CER_IPD_Terra-MODIS_SubsetSSIT_000000.2000062316	Binary	Imager data file containing pixel-level cloud property data
CER_IPD_Terra-MODIS_SubsetSSIT_000000.2000062316.met	ODL	Metadata load file for imager data file
CER4.1-4.1P1_MCFScr_Terra-FM1+FM2-MODIS_SubsetSSIT_000000.2000062316	ASCII	Toolkit generated file used in reading metadata
MCFWrite.temp	ASCII	Toolkit generated file used in writing metadata
pcxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx[2]	Binary or ASCII	Toolkit generated work file

1. These files will be generated on execution of Subsystem software and are not included in the tar file.
2. A 30-digit random number is generated by Toolkit to append after pc in naming its temporary files.

Appendix D
Evaluation of Comparison Software Output

There are four phases run during the execution of the Comparison Software. The progress of the program is shown on the screen during execution and should resemble:

Validating Data Products for <PGE>

.

Validating Metadata Files for <PGE>

.

Validating Support Files for <PGE>

.

Validating Log Files for <PGE>

.

Where <PGE> is the PGE being validated and the "." indicates a series of files evaluated during that phase. Data Products and Metadata files are those products produced by the subsystem. Support files are the PCF and its internal file. Log files are the Toolkit generated files. For each successful comparison, a message is issued:

Level <N> Comparison Successful for <FILE>

where "Level <N>" indicates the first level of test which yielded a successful result and "<FILE>" is the file compared. The levels you may see are:

Level 1: A flat binary compare between the generated and expected outputs was successful.

Level 2: An ASCII file, such as a log file, cannot successfully pass a binary compare. A successful Level 2 comparison means that certain strings, such as date, time, and OS specific fields, have been removed from both the generated and expected outputs and the results successfully compared.

Level 3: This level of comparison is provided for those support files, like the PCF, that may contain temporary file names generated by the Toolkit. This level of comparison removes the temporary file names from the generated and expected outputs.

Level 4: This level of comparison is used only to execute the software developed to compare Interim SSFs.

Level 5: This level of comparison is used to execute software developed to compare supposedly identical HDF files.